A CRITICAL EVALUATION OF DIFFERENT METHODS OF RECORDING CENTRIC JAW RELATION OF COMPLETELY EDENTULOUS INDIVIDUALS -AN INVIVO STUDY

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CERTIFICATE

This is to certify that the dissertation titled **"A Critical Evaluation of Different Methods of Recording Centric Jaw Relation of Completely Edentulous Individuals"-An In vivo Study** is a bonafide record of work carried out by **Dr. VIKAS CHAHAL**, during the period of 2006-2009. This dissertation is submitted in partial fulfillment, for the degree of Master of Dental Surgery awarded by Tamil Nadu Dr. MGR Medical University, Chennai in the branch of Prosthodontics. It has not been submitted partially or fully for the award of any other degree or diploma.

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Declaration

I, **Dr. VIKAS CHAHAL**, do hereby declare that the dissertation titled **"A Critical Evaluation of Different Methods of Recording Centric Jaw Relation of Completely Edentulous Individuals"-An In vivo Study"** was done in the Department of Prosthodontics, Tamil Nadu Government Dental College & Hospital, Chennai 600 003. I have utilized the facilities provided in the Government dental college for the study in partial fulfillment of the requirements for the degree of **Master of Dental Surgery** in the specialty of **Prosthodontics (Branch VI)** during the course period **2006-2009** under the conceptualization and guidance of my dissertation guide**, Dr.C.Sabarigirinathan, MDS.**

I declare that no part of the dissertation will be utilized for gaining financial assistance for research or other promotions without obtaining prior permission from the Tamil Nadu Government Dental College & Hospital.

I also declare that no part of this work will be published either in the print or electronic media except with those who have been actively involved in this dissertation work and I firmly affirm that the right to preserve or publish this work rests solely with the prior permission of the Principal, Tamil Nadu Government Dental College & Hospital, Chennai 600 003, but with the vested right that I shall be cited as the author(s).

Signature of the PG student Signature of the HOD

Signature of the Head of the Institution

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CONTENTS

INTRODUCTION

INTRODUCTION

The accurate recording and transfer of jaw relation records[1] from the edentulous patient to the articulator is essential for the restoration of function, speech, facial appearance, and maintenance of the comfort to patient's stomatognathic system. The patient's maxillomandibular relationships are dynamic and changes have been observed as age advances.

Yoshiyuki Watanabe[2] has mentioned that occlusal stability is an important aspect for success of prosthetic treatment, and can only be achieved with an accurate determination of the mandibular position. When, as dentists we are faced with the problem of replacing occlusal surfaces, either by restorations in natural teeth, or replacement of some or all of the teeth, then a thorough knowledge of the way teeth come together and function together, is essential.

There are only approximate guides available to determine where to place the teeth; two of the most important of these are vertical and horizontal relationship[3] of the mandible to the maxillae, when constructing a complete denture.

The mandible, though, exhibits a consistent movement vertically only when it undergoes pure rotation around a horizontal axis[4], and this

can be used to obtain a reproducible mandibular position at a determined vertical dimension. At this occlusal height, the teeth are placed so that the most stable tooth contacts occur in maximum intercuspation.

Maxillomandibular relations[3] and occlusion create more controversy than any other dental subjects. Since these subjects are considered the meeting ground of all the disciplines in the dentistry, dissension is to be expected. Several factors contribute to this situation:

(1) Difference in interpretation of definitions,

(2) Usage of terminology that is not universally understood,

(3) Difference in the interpretation of clinical results,

(4) Enthusiasm created in science efforts to produce mechanical instruments that will record and reproduce exact movements of living tissues, and

(5) Differences in the evaluation of jaw relations and occlusion of natural teeth and relating and applying these findings to the complete edentulous patient.

We know that proprioceptive impulses (impulses of three-dimensional spatial orientation) guide the mandibular movements. In dentulous patients the proprioceptive impulses are obtained from the periodontal ligament.

Edentulous patients do not have any proprioceptive guidance from their teeth to guide the mandibular movements. The sources of proprioceptive impulses for an edentulous patient are transferred to the temporomandibular joint.

For the rehabilitation of an edentulous patient, a learnable, repeatable and recordable maxilla to mandible relation is required, which remains constant throughout the life.

There is substantial evidence indicating that, when dental influences are eliminated, a healthy elevating musculature will position the condyle in its most anterior and superior bracing position against the eminence. This seated condylar position has been referred to as *centric relation*.

Centric relation can be defined as: "*The maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective discs with the complex in the anterior-superior position against the slopes of the articular eminences. This position is independent of tooth contact. This position is clinically discernible when the mandible is directed superiorly and anteriorly. It is restricted to a purely rotary movement about the transverse horizontal axis" (GPT-5)*[5]

Centric relation is the starting point of occlusion. If we were asked to select the one arch-to-arch relationship that is most important to the comfort, function, and health of the gnathostomatic system, we would have to say without reservation, centric relation.

Centric and eccentric relations of mandible can be recorded through check bites, graphic recordings, functional recordings and cephalometrics. These records are then transferred to a semi-adjustable articulator so that it can be set to simulate the various jaw movements.

This study is an attempt to compare the relative accuracy of the three different methods of recording centric relation using intraoral tracing method as a standard. The comparison of the four registered records of centric relation will be done using Spilt-Cast mounting[6] on semiadjustable articulator and by using another modified Ash's free plane articulator.

Various methods[7] have been proposed for recording centric relation. Much controversy has existed between proponents of different techniques for obtaining interocclusal centric relation record. The methods used for recording centric relation may be classified broadly as static or functional, and each of these may be extraoral and intraoral techniques.

The static methods[3] are those that involve first placing the mandible in centric relation with the maxillae and then making a record of the relationship of the two occlusion rims to each other. This method has advantage of causing minimum displacement of the recording bases in relation to the supporting bone.

The functional methods[3] are those that involve functional activity or movement of the mandible at the time of the record is made. These methods have the disadvantage of causing lateral and anteroposterior displacement of the recording bases in relation to the supporting bone when the record is being made.

Accurate records of centric relation have been made by all the methods in both classes although incorrect records also have been made by the methods in both classes. This means that, irrespective of the method used, subsequent clinical checking and rechecking must be done throughout the denture construction phase.

The aims and objectives of this study are

(1) To compare the efficiency of hight tracer[8], conventional intraoral tracer[8], mush bite technique[5] and Nick and Notch method[5] in determining centric relation.

(2) To evaluate the consistency of centric relation records obtained with four different techniques,

(3) To compare the deviation of centric relation records in horizontal plane obtained with three different techniques to those obtained with intraoral tracing technique, and

(4) To evaluate the deviation of centric relation records obtained with four different techniques using Split Cast technique.

REVIEW OF LITERATURE

REVIEW

The determination of centric relation of the mandible to the maxillae is of paramount importance in almost all fields of dentistry. A survey of current literature shows evidence of controversy existing in the field of interocclusal records. Numerous methods of registering centric relation have been described, and considerable criticism has been levied against each method by various authors. Condyle/fossa relationships in centric relation have been studied for some time. In the past, most Gnathologists suggested "rearmost, uppermost, and midmost" to describe the condyle position in centric relation.

More recently, **Dawson**[9] has stated that rearmost and uppermost is an inaccurate description because the condyles cannot be in the "rearmost" position when they are in "uppermost" position and vice versa.

Krishan K. Kapur and A. Albert Yurkstas (1957)[10] – Evaluated the commonly used methods of recording centric relation in completely denture patients. The following three methods were selected for the purpose of the experiment: (1) extraoral tracing procedure (after Stansberry), (2) intraoral tracing procedure (after Hardy), and (3), wax registration procedure after Hanau. It was found that the intraoral tracing

procedure and extraoral tracing procedure were more consistent as compared to the wax registration method.

Edward C. Jarvis (1963)[11] — described the use of a device for recording centric relation with equalized pressure and the swallowing function. The advantages of this procedure include the equal distribution of pressures, the minimal displacement of tissues, and freedom of tongue movement while the record is made. It is a simple technique requiring a minimal armamentarium and a short operation time.

J. Michman and A. Langer (1963)[12] - Compared the results of centric relation registrations in edentulous patients as obtained by 3 different methods: interocclusal wax records, intraoral tracings with the use of a Coble balancer, and teeth arranged on wax occlusion rims. Centric relation was recorded in 439 edentulous patients by 3 different methods. The intraoral tracing technique gave better results than the commonly used method of an interocclusal record, made with the use of wax rims alone. The technique which involves all upper and 6 lower anterior teeth tentatively arranged in the record bases verified the results obtained by the intraoral tracing device in 92.8 per cent of the subjects who were tested.

A. Albert Yurkstas and Krishan K. Kapur, (1964)[13] – Discussed the different factors influencing the centric relation records in edentulous

mouths. They listed 12 different factors which can influence the registration of centric relation records in edentulous individuals.

George A. Hughes (1964)[14] – published an article named "*DISCUSSION OF "FACTORS INFLUENCING CENTRIC RELATION RECORDS IN EDENTULOUS MOUTHS"* which was a reviewing of the article presented by A. Albert Yurkstes and Krishan K. Kapur in 1964.

William R. Dykins, (1968)[15] **–** told "Only to those who have had sufficient experience in removing all the occlusal surfaces of the natural teeth for a patient and, then, have been compelled to orient the lower jaw in relation to the upper jaw does the problem of centric relation become most meaning.ful and appreciated. The corollary to that statement relegates the concept of quadrant dentistry to a secondary role if the goal is maximum oral health in which function plays its part. This procedure only perpetuates a jaw relationship which, in the majority of patients, is incorrect". Under his article named *"A consideration of centric relation"*.

Boyan Boyanov (1970)[16] – Discussed anthropometric methods for determining the vertical dimension of occlusion and the functional-reflex method for determining centric relation have been described. He told these techniques were easy to handle, do not require special instruments, and can be used by any dentist after several trials with the first patient.

William E. Avant, (1971)[17] – told under the article named *"Using the term "Centric" "* that "The word "centric" is an adjective that should not be made to function as a noun. Centric relation is a bone-to-bone (mandible to maxillae) relation. Centric occlusion is a tooth-to-tooth relation (mandibular teeth to maxillary teeth). Therefore, centric relation and centric occlusion are not the same by definition; however, often they both can exist at the same time".

John L. Shannon (1972)[18] – Described a method of verifying centric relation at an established vertical relation without resetting individual posterior teeth to test the position of centric relation.

Robert A. Strohaver (1972)[19] – Conducted a study to compare articulator mountings made with centric relation and myocentric position records. He concluded: (1) the zinc oxide and eugenol method (Method Z) utilizing a Lucia jig produced the least variable group of articulator mountings made with interocclusal records. (2) Method Z also produced the most posterosuperior (retruded) relationships of the mandibular cast to the axis of the articulator. (3) The least variable of all methods for mounting the mandibular cast was Method O in which the casts were hand articulated in maximum intercuspation (occlusal position or centric occlusion). (4) Myocentric position records made with the

Jankelson Myo-Monitor (Method M) produced the most variable group of articulator mountings of the 6 methods tested.

James Hart long (1973)[20] – Gave a method to modify Hanau model H articulator so that it can be used to compare several tentative centric relation registrations. A comparison of the records of several centric relation registrations and a protrusive relation registration help students select the one which has recorded the centric jaw relation correctly.

Mohsen Azorbal (1977)[21] – conducted a study on Comparison of Myo- Monitor centric relation and centric occlusion. Twenty dentulous subjects were selected at random. A Hight tracer, fixed on the labial surface of the teeth by special clutches, was used to indicate a record of centric relation and centric occlusion. The Myo-Monitor centric position was recorded and compared to centric occlusion and centric relation in anteroposterior and lateral dimensions.

This study indicated that:

1. Myo-Monitor centric position is always anterior to centric relation, with an average of 3.8 mm.

2. Myo-Monitor centric position is always anterior to centric occlusion, with an average of 1.8 mm.

3. In 18 of 20 subjects, the Myo-Monitor registration was to the right or to the left side of the line between centric relation and centric occlusion.

4. In all subjects, centric occlusion was an average of 2.2 mm. anterior to centric relation.

M. Helft, H. Cardash and Kaufman (1978)[22] – discussed a technique that overcomes maxillomandibular relationship errors and involves recording centric relation, making impressions, and making the facebow record in one appointment.

E. H. Wiiliamson (1978)[23] – Discussed Laminagraphic study of mandibular condyle position when recording centric relation. Laminagraphs were made of each temporomandibular joint of 20 subjects (1) with the mandible forcefully retruded to centric relation and (2) with the mandible positioned by a closing force while an anterior guidance prosthesis was being used. The radiographs were compared by measurements of condylar position; results indicated the condyles to be significantly more superior in the glenoid fossa when anterior guidance was used. The difference in anterior-posterior positioning of the condyles appeared to occur randomly.

William B. Akerly, (1979)[24] – described a tripodal method of recording centric relation. A tripodal arrangement of recording centric

relation was conceived in the use of copper bands to make tentative maxillomandibular registrations in centric relation and to mount casts on an articulator. Then centric check points, designed by Brewer, were attached to the maxillary and mandibular record bases to verify the accuracy of the tentative registration. The tripodal arrangement of registration tacks was developed to replace the copper bands and improve the accuracy of the tentative registration. This method was used to record and check centric relation records for complete dentures.

Michael Myers, Robert Dziejma, Joel Goldberg, Robert Ross, and John Sharry (1980)[25] – Conducted a study discussing relation of Gothic arc apex to dentist-assisted centric relation. They concluded that the widely held belief that thumb pressure can position the mandible consistently more posterior than the position indicated by the Gothic arch apex is unfounded. Furthermore, this study provides no evidence to support the contention that the dentist-assisted jaw relation is more reproducible than the relation indicated by the Gothic arch apex.

Larry Sindledecker (1981)[26] – Conducted a study and discussed Effect of different centric relation registrations on the pantographic representation of centric relation. He concluded 1. Centric relation is recorded within an area, rather than as a precise point. In this study, the range of this area depends on the material used: (1) wax, 0.21 mm; (2)

zinc oxide-eugenol paste, 0.12 mm; and (3) acrylic resin, 0.11 mm. 2. Variances for recording methods and for location of centric relation are not transferable from one subject to another; however, values of variances can be compared from one subject to another. 3. At the 95% significance level, the reliability of interocclusal wax records for recording a point in space was less than for other methods. 4. At the 95% significance level, wax gave statistically different centric relation registrations from those of zinc oxide-eugenol paste or acrylic resin.

Adel M. Abdel-Hakim (1982)[27] – Discussed the swallowing position as a centric relation record. He concluded the swallowing positions for all the patients showed varying degrees of deviation from intercuspal position. Anteroposteriorly, the mean deviation for the group was 1.35 & 0.99 mm. The maximum anterior deviation (3.5 mm) was double the maximum posterior deviation (1.7 mm). As variations in recording retruded contact and muscular positions" are inevitable, the swallowing positions were related to the intercuspal position.

Mohssen Ghalichebaf, Varoujan A. Chalian, and Robert L Bogan (1986)[28] – Discussed a flashing-light method for recording centric relation. In this method a flashing-light system has been described which provides a simple method for ensuring equalized pressure in recording the relationship of the mandible to the maxillae. The wires that protrude from

the mouth do not appear to create any discomfort or distraction during the procedures. This method tends to be more comfortable than extraoral or intraoral tracing techniques.

Lily T. Garcia, (1987)[29] – told about "Aid to a stable centric relation record". A common method involves notching the maxillary wax occlusal rim bilaterally in the posterior molar regions. When the recording media is impression compound, the temperature necessary to soften it may distort the notches. The recording media may lock into undercuts in the notches when present. This article described the fabrication and use of a metal notch for use in recording centric relation.

George II. Latta (1992)[30] – Discussed about influence of circadian periodicity on reproducibility of centric records for edentulous patients. Complete dentures were made for 30 edentulous patients. The patients were divided into three groups and the dentures were remounted twice on the same day in a Vericheck instrument. The dentures for 10 patients were remounted twice in the morning (AM group), for 10 patients twice in the afternoon (PM group), and for IO patients once in the morning and again in the afternoon (AM-PM group). Changes in position between the interocclusal records were measured on both the right and left horizontal X and Y axes and the sagittal Y and 2 axes. No significant changes were noted when horizontal versus sagittal or right versus left positions were

compared, but significant changes were noted between the AM versus AM-PM time groups, and between the PM versus AM-PM time groups.

Mohammed Aleem Abdullah (1995)[31]: This study investigated the acceptability of lateral interocclusal records. Sixty lateral interocclusal records were made for 30 edentulous subjects, and the acceptability of the records was evaluated by use of the split-cast mounting procedure. Out of 60 lateral interocclusal records, 52 (87%) records were accepted by the articulator. A Z test was used for two proportions and was statistically significant ($p < 0.05$).

Eva Piehslinger, Walter Bauer, and Heinz Bodo Schmiedmayer (1995)[32]: The effect of arbitrary mounting of maxillary casts on occlusal relationships was investigated in this study. Maxillary casts of 31 volunteers were mounted on an articulator by use of two split cast bases. This mounting was done first with the arbitrary face bow and second with a hinge bow. Three reference points were defined and measured on each maxillary cast with a three-dimensional digitizer. The measurements were taken from the arbitrarily mounted cast and from the cast mounted according to the hinge axis. Opening and closing movements that were transferred from the articulator to the mouth of the patient were simulated by a computer based on measurements of the reference points. The results revealed that the use of an arbitrary face bow

causes a deviation of the hinge-axis points from the precise axis of more than 5 mm in 77% of the cases.

Ales Obrez and Christian S. Stohler (1996)[33] – Discussed about jaw muscle pain and its effect on Gothic arch tracings. On the basis of the results of this study, it was concluded that experimentally induced tonic masticatory muscle pain affected the mandibular border movements as observed in the horizontal plane. Experimental muscle pain also significantly affected the location of the most posterior mandibular position from which the lateral border movements could be made.

Janos Angyal, and Gusztav Keszthelyi, (1996)[34] – told about "Verifiable method for registering the centric relation position in dentulous arches with a central bearing point." Angyal and Keszthelyi described a technique for fabrication of a centric relation record-based occlusal splint with a central-bearing device. This article describes a visually verifiable procedure for the clinical application of that method for making a centric relation record when teeth are present in the mouth.

Richard P. Harper and Emet Schneiderman (1996)[35] – Discussed about condylar movement and centric relation in patients with internal derangement of the temporomandibular joint. The reproducibility of condylar movement and axis point determination of the mandibular condyle in centric relation was studied with the use of a sagittal recording device. Thirty patients were divided into two groups based on the absence

or presence of clinical signs of TMJ internal derangement. Three sequential axiographs were taken at not less than 3-month intervals for each patient. Functional analysis of condylar movement pathways and cephalometric analysis of condylar axis point in centric relation were completed for each investigation session. Analysis of the condylar movement pathway showed greater reproducibility in the control group. The group with TMJ internal derangement showed greater variability in the condylar translation paths. The between-group differences invariability were significant at $p<0.0005$ and $p<0.0003$ for right and left sides respectively.

Adeliani A. CamposDan Nathanson and Lynda Rose (1996)[36] – Discussed about reproducibility and condylar position of a physiologic maxillomandibular centric relation in upright and supine body position. In this clinical study the swallowing technique was modified to establish a physiologic centric relation in a reproducible manner. Condylar and disk positioning and reproducibility of the proposed modified swallowing technique (MST) were compared with the same parameters of a traditional technique, namely, the chin point guidance technique (CGT). Both techniques were studied with the patient in the upright and supine positions. Three interocclusal records were obtained for each technique-position combination for each of the 30 patients. The recorded maxillomandibular relations were analyzed on the three- dimensional

analyzer. MST positioned the condyles in a more superoanterior position than did CGT, which was interpreted as a better seating of the condyles and disk in the articular fossae. There was no significant difference in reproducibility between MST and CGT on x, y, or z axes ($p > 0.05$), indicating that it is possible to establish a physiologic centric relation in a reproducible manner. The term "functional centric area" was proposed in this study to define a neuromuscularly determined centric occlusal scheme.

James R. McKee, (1997)[37] – Compared condylar position repeatability for standardized versus nonstandardized methods of achieving centric relation. This study was designed to determine whether a standardized method of achieving centric relation would be repeatable within the 0.11 mm tolerance of the Denar Centri-Check instrument. The control group did not repeat condylar position within the 0.11 mm tolerance of the Denar Centri-Check instrument, whereas the experimental group did repeat condylar position within the 0.11 mm tolerance of the Denar Centri-Check instrument in 106 of 110 first attempts and in 4 of 4 second attempts.

Izharul Haque Ansari, (1997)[38] -- This article describes a two-in-one modified custom tray and record block system that is recommended for compromised elderly patients. Custom trays, which are made on primary casts and formed from a patient's functionally corrected old

dentures, are used to make final impressions and centric jaw relation records in one clinical appointment. The clinical visits are reduced without compromising the quality of denture construction.

Ales Obrez, and Jens C. Türp, (1998)[39] -- This article, which was based on an assessment of both the past and the most recent basic science and clinical literature, evaluated the effect of musculoskeletal facial pain on two static (physiologic rest position and centric relation) and two dynamic (protrusive border and lateral border movements) maxillomandibular relationships. Author concluded that musculoskeletal facial pain seemed to variably affect the aforementioned positions and movements. Hence, the validity of maxillomandibular registrations in patients with existing facial pain was questioned. In those patients with facial pain who simultaneously were in need of a prosthodontic rehabilitation, clinicians should be cautious with regard to the timing of the restorative procedures.

Michael R. Fenlon, Martyn Sherriff, and John D. Walter (1999)[40] – studied association between the accuracy of intermaxillary relations and complete denture usage. They concluded that Positive associations were found between the accuracy of intermaxillary relations and complete denture usage.

Urbano A. Santana-Penin, and Luis Da Silva Dominguez (1998)[41]: This article describes a simple, fast, and inexpensive method that facilitates accurate mounting of mandibular diagnostic casts**.**

Yoshiyuki Watanabe (1999)[42] – described the use of personal computers for Gothic arch tracing. This study analyzed and evaluated the horizontal mandibular positions produced by different guidance systems. Twenty-six edentulous subjects with no clinical evidence of abnormality of temporomandibular disorder were selected. Horizontal position data for the mandible obtained by Gothic arch tracing was loaded into a personal computer by setting the sensor portion of a digitizer into the oral cavity to serve as a miniature lightweight tracing board. By connecting this with a digitizer control circuit set in an extraoral location, each mandibular position was displayed in a distinguishable manner on a computer display in real time, then recorded and analyzed. He concluded that this system provides effective data concerning mandibular positions for fabrication of dentures.

Majid Bissasu, (1999)[43] – described the use of tongue for recording centric relation for edentulous patients. This article described a simple procedure that enables the edentulous patient to put the tip of the tongue in

the most superior posterior position in the mouth, to retrude the mandible to its centric relation position, and to reduce the hazards of protruding the

mandible from its retruded position during closing the mouth to centric relation.

Curtis M. Becker, David A. Kaiser, and Conrad Schwalm, (2000)[44] -- This article presented a discussion of the historical aspects of centric relation. Guidelines to decide when to use centric relation in clinical dentistry are also included. This article presents a brief discussion of the evolution of dentistry to define the term *centric relation.*

Donna L. Dixon, (2000)[45] – presented overview of articulation materials and methods for the prosthodontic patient. This review evaluated the methods and materials used to record the centric relation position and eccentric maxillomandibular relations, and to compare the articulators available for mounting casts. Potential applications of this review were as follows: (1) to allow the reader to examine the various methods for recording the centric relation position that have been studied and described, and (2) to observe how the accuracy of recording materials have changed over time. The reader will also realize the types of simple and complex articulators that exist, along with the different degrees of simulated mandibular movements that may be accomplished.

Joseph J. Massad, Mark E. Connelly, Kenneth D. Rudd, and David R. Cagna, (2004)[46] – told about an occlusal device for diagnostic evaluation of maxillomandibular relationships in edentulous patients. They advocated that the use of this occlusal device will serve to: (1) aid

in neuromuscular deprogramming of habitual mandibular posturing influenced by the malocclusion of existing ill-fitting complete dentures, and (2) facilitate diagnostic evaluation of the patient's esthetic, phonetic, and functional tolerance of maxillomandibular relationships proposed for complete denture therapy. Achieving these diagnostic objectives may take weeks or months.

Sergio S. Nogueira, Sergio Russi, Marco Antonio Compagnoni, and Francisco de Assis Mollo (2004)[47] : This article describes a variation of the split-cast mounting technique wherein the border of the definitive cast is wrapped with masking tape to form a container for the dental plaster normally used to affix the cast to the articulator. The entire inferior surface of the cast is coated with a thin film of petroleum jelly, and the cast is mounted in the articulator. After the dental plaster has set, the cast is retained by means of masking tape. The cast is separated from the dental plaster simply by removing the masking tape.

V. V. Nandini, K. C. Nair, M. C. Sudhakar, T. S. Poduval (2005)[48] -Conducted a clinical study on Comparative evaluation of hight tracer, Chandra tracer, intraoral tracer, functiograph and checkbite. This study was an attempt to compare the relative accuracy of the checkbite and graphic recordings using cephalometrics as a standard. Hight tracer, Chandra tracer, Conventional intraoral tracer, Functiograph and Checkbite were used on 10 edentulous subjects to obtain centric and

protrusive records. Lateral cephalograms were made at both centric and protrusive positions with each method and the horizontal condylar values thus obtained were compared with those obtained on Hanau H2 articulator. They found that

1) There was no statistical difference between the cephalometric and articulator values in all the five experimental methods.
2) There was no significant difference between Hight tracer, Chandra tracer, Intraoral tracer, Functiograph and Checkbite methods.
3) Ranking the experimental methods in the order of efficiency: the first was the Intraoral tracer, second being Functiograph followed by Chandra tracer, Checkbite and Hight tracer.
4) Checkbite alone can be used to set the horizontal angles on the articulator in edentulous subjects, clinically.
5) Tracings can be used as a verificatory method.
6) Centric relation position was found to be the same in a subject with all the experimental methods.
7) Each experimental method can influence the condylar path differently in the eccentric position.

MATERIALS & METHODS

MATERIALS AND METHODS

This in-vivo study was performed to compare the reproducibility of different methods of recording centric jaw relation from same edentulous patient. Ten edentulous patients who exhibited good health, average neuromuscular co-ordination, and relatively good ridges were selected at random from Prosthodontics department of Tamil Nadu Govt. Dental College & Hospital Chennai. Equal numbers of male and female patients were selected between age group of 50 to 60 years. A total number of 10 edentulous individuals were subjected to this study with class I skeletal relationship. The patients were informed about the study and their written informed consent was obtained before the commencement of this procedure.

MATERIALS USED IN THIS STUDY

S. No	NAME (commercial name)	FORM OF THE MATERIAL	MANUFACTURER DETAILS
1.	DPI Heat Cure	Heat activated poly(methylmethacrylate) resin	Dental Products of India Limited,India
2	Cavex Set Up	Modelling wax	Cavex, Holland BV

	Hard		
3	Aluwax	Bite Registration Wax	Aluwax Dental Products company U.S.A.
4	Virtual Refill Bite Registration	Vinylpolysiloxane Bite registration Material	Ivoclar Vivadent USA

INSTRUMENTS AND EQUIPMENTS USED IN THE STUDY

S. No	NAME (commercial name)	FORM OF THE MATERIAL	MANUFACTURER DETAILS
1	Modified Ash Free Plane Articulator	Modified Ash Free Plane Articulator	Custom made
2	Type AEB Dentatus Sweden	Arbitrary Face Bow	Dentatus, Sweden
3	Type ARH Dentatus Sweden	Class III semiadjustable Articulator	Dentatus, Sweden

4	The Hight Tracer	Extraoral Gothic Arch tracing Device	Teledyne Hanau (NY) USA
5	Gnathometer M Typ 2	Intraoral tracing device	Ivoclar Vivadent, USA

Aluwax[49]: (Fig.1) Aluwax dental wax is a sophisticated composite material which contains powered aluminium to increase the integrity of compound and increase the heat retention properties needed for efficient modelling.

Hard Modelling Wax[50]: (Fig.2) Cavex Set Up Soft, Cavex Set Up Regular and Cavex Set Up Hard form a series of waxes for dental purpose. They are available in the form of red-coloured sheets that can be easily softened over a flame, or otherwise, and modelled to the desired shape.

Heat activated denture base resin[51]: Most poly(methyl methacrylate) resin systems consist of powder and liquid components. This type of resin has wide uses in dentistry, in this study it is used to make record bases.

Dental Stone[52], (Type III): This is an α-hemihydrate of the gypsum product having wide use in dentistry.

Vinylpolysiloxane Bite Registation Paste (**Virtual Refill Bite Registration)**[53] **:**(Fig.3) this is an addition silicone material, which is being used for registration of centric relation records in intraoral and extraoral tracing techniques in this study. It is supplied in automix cartridges.

Hight tracer: (Fig.4)The hight tracer is a four-component assembly, which consists of an upper bearing plate, lower bearing plate with a central screw, a scriber point to be attached to the upper rim and a tracing platform which extends 3 in. forward and is attached to the lower rim.

Intra oral tracer (**Gnathometer M Typ 2):** (Fig.5) The tracer consists of an upper bearing plate and a lower bearing plate with a screw and scribing point at the centre.

Class III-A semi-adjustable articulator (**Type ARH Dentatus Sweden)**[54]**:** (Fig.6) This is a non-Arcon instrument, i.e. the condylar elements are on upper members. This articulator is unique in that the relationship between the upper and lower members can be standardized with a "gauge block" so that casts can be transferred from one articulator to another and still maintains the same relationship.

Face-bow[54]**:** (Fig.7) The face bow is a calliper like instrument used to orient the maxillary cast on the articulator so that it has the same relationship to the opening axis of the jaws. It is simple to use and

relatively accurate. Arbitrary face bow, (Type AEB Dentatus) is being used in the present study.

Modified Ash's Free Plane Articulator: (Fig.8) Ash free plane articulator is a Class II instrument, that permits horizontal as well as vertical motion but do not orient the motion to the temporomandibular joint via a face-bow transfer. **Krishan K. Kapur and A. Albert Yurkstas (1957)** used an instrument similar to Hooper's duplicator in their study. A Hanau type of mounting ring was attached to the upper element by means of a center bolt, machined so that one full revolution would raise or lower the ring 1.0 mm. The three legs of the tripod were tipped with pointed tool steel cylinders, which could be moved up and down independently. The base of the instrument had a mounting table and three projecting arms with 1.0 mm. grids inscribed on the steel squares fixed at their extremities. The exact center of the grid was pitted and the pointed ends of the tripod fitted exactly in the center of each grid.

In this study some modification were made in the Ash Free Plane articulator, using the concept of the study done by Krishan K. Kapur and A. Albert Yurkstas (1957). The posterior hinges were removed and the upper member of the articulator was separated. Now the upper member is so positioned on the lower so that the incisal rod has a clearance of 7.5 mm in all the horizontal directions, i.e. anteroposteriorly and laterally,

without any hindrance. Now the upper member is free to orbit in horizontal plane with a radius of 7.5 mm.

Grouping of Samples: The reading taken in this study are broadly grouped in two main groups

Group 1: Readings evaluated with the help of Spilt Cast mounting.

Group 2: Readings evaluated with the help of Modified Ash Free plane Articulator.

Each group is further subdivided into *4 subgroups*, namely

(1) Intraoral tracing records evaluated with split cast mounting designated as '**1A**'

(2) Extraoral tracing records evaluated with split cast mounting designated as '**1B**'

(3) Nick and Notch occlusal records evaluated with split cast mounting designated as '**1C**'

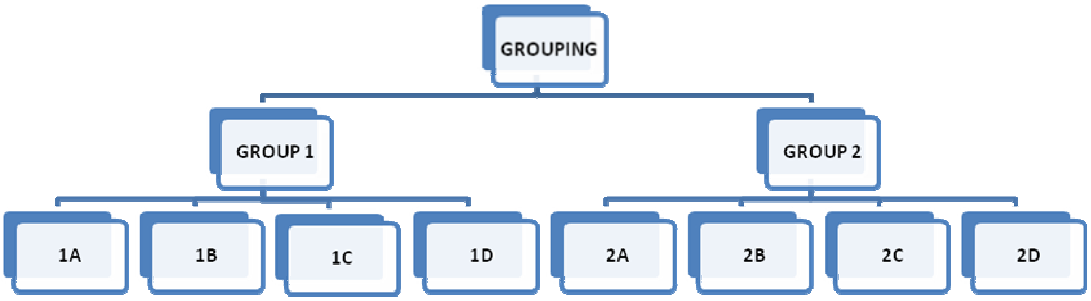
(4) Mush Bite technique records evaluated with split cast mounting designated as '**1D**'

(5) Intraoral records evaluated with modified Ash's free plane articulator designated as '**2A**'

(6) Extraoral records evaluated with modified Ash's free plane articulator designated as '**2B**'

(7) Nick and Notch records evaluated with modified Ash's free plane articulator designated as '**2C**'

(8) Mush Bite technique records evaluated with modified Ash's free plane articulator designated as '**2D**'



Methodology

Diagnosis and Impression Making: Edentulous individuals of age ranging from 51 to 60 years were taken in this study. All the selected patients were in good health, average neuromuscular co-ordination, and had relatively good ridges. All the patients were selected with Angle's Class I maxillomandibular skeleton relationship. Primary impression was made with Type II impression compound and primary casts were made. Custom trays on these primary impressions were fabricated with chem. activated denture base resin (DPI, India) with 1.5mm wax spacer. Trays were trimmed and checked for extension in the patient's mouth. Then

border molding was done with low fusing tracing compound and secondary impression was made with Zinc Oxide Eugenol impression paste, the impression was poured with Type III dental stone to obtain the master casts. This master cast was then duplicated (Fig.9) with reversible hydrocolloid to get two pairs of upper and lower casts. Four pair of record bases (Fig.10) having same thickness and extension was made with heat activated acrylic resin.

Face-Bow record was made with Dentatus face-bow (Fig.12) and transferred to the Dentatus semiadjustable articulator (Fig.13). The upper cast was mounted on the upper member of the articulator by using Split Cast Technique.

Split-Cast mounting: (Fig.19) A method of mounting casts wherein the dental cast's base is sharply grooved and keyed to the mounting ring's base. The procedure allows verifying the accuracy of the mounting, ease of removal and replacement of the casts to the upper member of articulator. It provides a precise means of correcting the occlusion discrepancies occurring as a result of the processing errors.

Intraoral technique: (Fig.14) The occlusal rims were fabricated and the intraoral (Gnathometer Typ M Ivoclar Vivadent) tracer was mounted on the rims after the mandibular rim was reduced by 3 mm height. The pin was adjusted to contact the plate in the upper rim at the correct vertical

dimension. The upper plate was coated with permanent marker ink. The rims were placed in the mouth and the subject was asked to carry out the eccentric movements. After many such movements, tracings were examined. Once a clear apex was obtained, a small transparent plastic sheet with a central hole was mounted with the hole coinciding with apex of the tracing. This was attached to the tracing plate with sticky wax. Patient was made to move the jaw until the pin fell into the hole which represents centric jaw position and bite registration silicone (Virtual Refill Bite Registration, Ivoclar vivadent) was injected in between the rims and centric record was obtained. Recordings were repeated five times and the most accepted record was accepted. The lower cast is mounted on the semiadjustable articulator according to this interocclusal record taken with intraoral tracing technique, keeping the articulator readings on mean values. All nuts of the semiadjustable articulator are tightened and secured.

Extraoral Tracing: (Fig.15) The upper bearing plate was heated and waxed to the maxillary rim, making it flush with the occlusal plane. The lower occlusal rim was reduced by 3 mm height and the lower plate was firmly luted to the mandibular rim to avoid any interference during jaw movements. The scriber was attached to the maxillary rim and lower tracing platform was attached to the mandibular rim. The upper and lower

tracers were made parallel. The vertical height was maintained by adjusting the central bearing screw. The tracing table was covered with lamp black and the patient was guided to close the jaw in centric relation and lateral excursion repeatedly till a Gothic arch tracing with single sharp point was obtained. After satisfactory recordings were obtained, a transparent plastic sheet is secured over the tracing plate with the sticky wax then the bite registration silicone material was injected between the rims and was allowed to set, while the stylus rested on the apex of the arrow point tracing. Recordings were repeated five times and the most accurate record was accepted. Patient was asked to hold the pin in the hole during the process. Plastic sheet with the drilled hole was used to stabilize the position. This centric record was taken.

Registration by Nick and Notch Method: (Fig.17) This procedure derives its name from the shape of the indices made on the occlusal rims. This is the most common method of indexing the recorded centric jaw relation.

2 to 3 mm of wax is removed on either side of the mandibular occlusal rim from the first premolar region till the distal end and the surface of the wax is grooved to hold bite registration wax. Two 'V' shaped notches are cut on the corresponding area on the maxillary occlusal rim. The notches are extended across the width of the occlusal rim. A nick is cut anterior to the notch. This also a 'V' shaped groove but

it does not extend throughout the width of the occlusal rim. The nick and notch on maxillary rim are lubricated with petrolatum jelly. The occlusion rims are now inserted into the patient's mouth and the patient is guided to close his mandible at the maximum retruded position. Once the patient is learned to close his mouth in centric relation, aluwax is placed on troughs created in the mandibular rim. The mandibular occlusal rim is placed in a water bath to soften the wax and inserted in to the patient's mouth. The occlusal rims are removed after hardening of the wax and placed in the cold water. Excess wax is trimmed of with wax carver. Recordings were repeated 5 times and the most accurate record was accepted.

Mush Bite Technique: (Fig.16) In this procedure occlusal rims are made with same vertical dimension already established, are taken and the patient is guided to close the lower jaw in the most retruded position. After two or three trials the records with wax rims are stabilized with stapler pins and the record is taken out of the mouth. Recordings were repeated 5 times and the most repeated record was accepted.

Evaluation of the centric jaw relation recorded with four different registration methods:

(1) Evaluation of extraoral tracing records in split cast technique: (Fig.21)

The occlusal rims with extraoral recordings are seated on the mounted upper and lower casts in semiadjustable articulator. Record bases are checked for complete seating on the mounted casts. Three reference points are made on the upper split cast, one anterior to the incisive papilla and two posterolaterally, each made 10 mm anterior to the posterior border of the maxillary tuberosity. After seating, the articulator was closed in centric position according to the interocclusal records obtained. The discrepancy between the cast and the split is measured with the help of a digital Vernier calliper. The readings are noted at all the three reference points; one anterior and two posterolateral which are already marked.

(2) Evaluation of Nick and Notch method in split cast technique: (Fig.23)

Now the centric relation records taken with Nick and Notch technique are properly seated on the mounted casts on semiadjustable articulator. After seating, the articulator is closed in centric position according to occlusal obtained and the discrepancy between the cast and the split is measured with digital Vernier calliper. The readings are noted at all the three reference points; one anterior and two posterolateral.

(3) Evaluation of Mush Bite technique in split cast technique :(Fig.22)

The records made with Mush bite technique are placed on casts in the semiadjustable articulator and the discrepancy at the split is noted and

measured with digital Vernier calliper on all the three reference points as described above.

Evaluation of centric jaw relation by modified Ash's free plane articulator: (Fig.24-27)

Now the centric relation records made with intraoral technique are taken and seated on the other set of duplicated casts, and mounted on the modified Ash's free plane articulator. Care should be taken so that the incisal rod should remain stabilized in the centre of the graph which is fixed on the incisal table. The plaster is allowed to set. Now the centric jaw relation records made with extraoral Gothic arch tracing technique are seated on the mounted cast in the modified Ash free plane articulator. The shift of incisal rod on the graph paper with extraoral records is noted in anteroposterior and lateral directions. The readings are measured with digital Vernier calliper.

Now the extraoral Gothic arch tracing records are taken out from the modified Ash's free plane articulator and centric jaw relation recordings taken with Nick and notch method are transferred on the mounted casts on Modified Ash's free plane articulator. The shift of the incisal rod is measured on the graph paper with the help of digital Vernier calliper, in anteroposterior and lateral directions. Readings (discrepancies) in anteroposterior direction, i.e., X axis are taken as negative, whereas readings (discrepancies) in lateral direction, i.e., Y axis

are taken as positive. Similarly the Nick and Notch method records are removed from the modified Ash's free plane articulator and the centric relation record taken with Mush bite technique are transferred on the mounted casts on modified Ash's free plane articulator. The shift of the incisal rod in the graph paper is measured with the digital Vernier calliper as explained above.

PHOTOGRAPGS

Fig.1 MODELLING WAX HARD

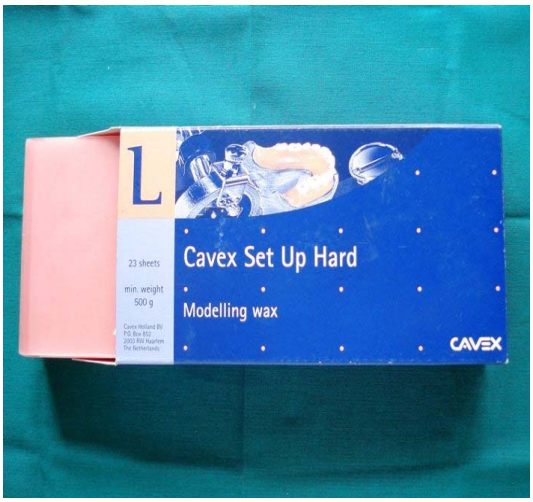


Fig.2 BITE REGISTRATION WAX

Fig.3 BITE REGISTRATION SILICON WITH DISPENSER

Fig.4 EXTRAORAL GOTHIC ARCH TRACING DEVICE (HIGHT TRACER)

Fig.5 INTRAORAL TRACING DEVICE WITH CENTRAL BEARING POINTS

Fig.6 SEMIADJUSTABLE ARTICULATOR (DENTATUS)

PLATE-A

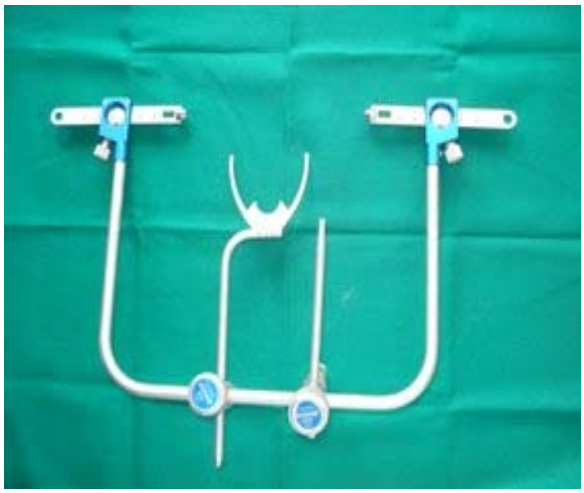


Fig.7 ARBITRARY FACE-BOW

Fig.8 MODIFIED ASH'S FREE PLANE ARTICULATOR

Fig.9 ORIGINAL AND DUPLICATE U/L CASTS

Fig.10 FOUR IDENTICAL U/L BITE RIMS

Fig.11 FOUR IDENTICAL U/L OCCLUSAL RIMS

Fig.12 FACE-BOW RECORD

PLATE-B

Fig.13 FACE-BOW RECORD TRANSFER

Fig.14 INTRAORAL TRACING RECORD

Fig.15 EXTRAORAL GOTHIC ARCH TRACING

Fig.16 MUSH BITE

Fig.17 NICK & NOTCH RECORD

Fig.18 FOUR DIFFERENT RECORDS FROM SAME PATIENT TAKEN

PLATE-C

Fig.19 SPLIT CAST MOUNTING

Fig.20 INTRAORAL RECORDS ON SEMIADJUSTABLE ARTICULATOR

Fig.21 EXTRAORAL TRACING RECORDS ON SEMIADJUSTABLE ARTICULATOR

Fig.22 MUSH BITE RECORDS ON SEMIADJUSTABLE ARTICULATOR

Fig.23 NICK & NOTCH RECORDS ON SEMIADJUSTABLE ARTICULATOR

Fig.24 INTRAORAL TRACING RECORDS ON MODIFIED ASH'S FREE PLANE ARTICULTOR

PLATE-D

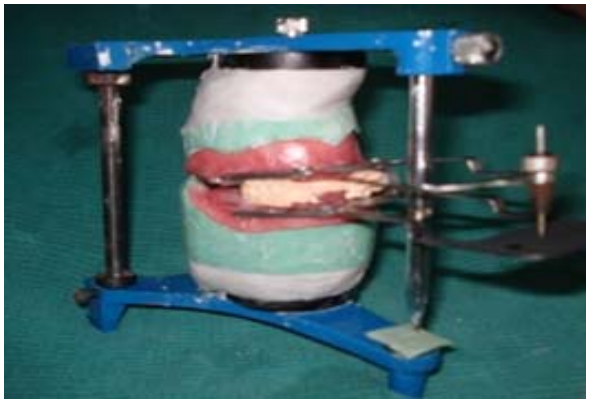


Fig.25 EATRAORAL TRACING RECORDS ON MODIFIED ASH'S FREE PLANE ARTICULTOR

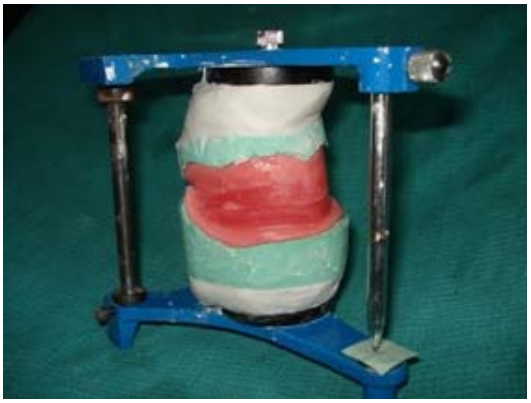


Fig.26 MUSH BITE RECORDS ON MODIFIED ASH'S FREE PLANE ARTICULTOR

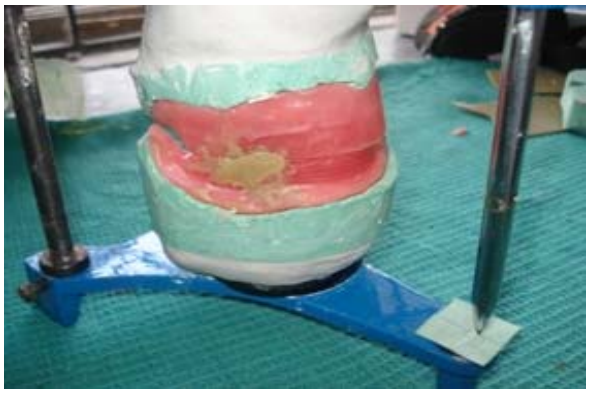


Fig.27 NICK & NOTCH RECORDS ON MODIFIED ASH'S FREE PLANE ARTICULTOR

Fig.28 MEASUREMENT OF DISCREPANCY ON SEMIADJUSTABLE ATRICULATOR (LATERAL)

Fig.29 MEASUREMENT OF DISCREPANCY ON SEMIADJUSTABLE ATRICULATOR (ANTERIOR)

Fig.30 MEARUREMENT OF DEVIATION OF INCISAL ROD ON GRAPH ON MODIFIED ASH'S FREE PLANE ARTICULTOR

PLATE-E

RESULTS

RESULTS

This clinical study was performed to evaluate the more accurate method of recording centric jaw relation in edentulous individuals which is routinely practiced. Ten edentulous individuals of five males and five females were taken up for this.

The basic data of the results of this study are shown in annexure from Table III to Table IV. Table III depicts the measurements noted by using split cast mounting for various subgroups based on different recording methods. In this table the readings of intraoral subgroup was categorized under subgroup 1A. This was considered as the control group. Each measurement was repeated five times and the mean is taken. The other records taken with other three different techniques were categorized under subgroup1B as reading of extraoral gothic arch tracing ,subgroup1C as reading taken with the help of nick and notch technique and subgroup 1D as the readings taken with the help of mush bite technique. The measurements at all the three points (two lateral points and one anterior) are taken as described earlier and mean values were taken.

Stastical analysis

Table Ia:

ANOVA Table	**SS**	**df**	**MS**
Treatment (between columns)	111.4	3	37.12
Residual (within columns)	0.3729	35	0.01066
Total	111.7	38	

Table Ib:

Newman-Keuls Multiple Comparison Test	**Mean Diff.**	**q**	**P Value**
SUBGROUP-1A vs SUBGROUP-1D	-4.329	129.1	0.0001***
SUBGROUP-1A vs SUBGROUP-1C	-3.709	110.6	0.0003***
SUBGROUP-1A vs SUBGROUP-1B	-1.661	49.52	0.0001***
SUBGROUP-1B vs SUBGROUP-1D	-2.668	81.73	0.0002***
SUBGROUP-1B vs SUBGROUP-1C	-2.048	62.75	0.0001***
SUBGROUP-1C vs SUBGROUP-1D	-0.6197	18.99	0.0003***

Note: * denotes significant at 1% level.**

INTERPRETATION OF RESULTS

In this study, the discrepancy of centric relation recordings is evaluated among four different recordings, taking intraoral records as control, by using split cast technique.

Then, the results were analyzed using the following statistical analysis. One way ANOVA test was used to assess the significant difference between different groups based on arc of closure tracing measurements. Table III depicts the split cast mounting discrepancies for various groups based on different methods and also shows the mean and standard deviation of the various subgroups.

Table IV depicts mean and standard deviation of different measurement among various subgroups evaluated by split cast mounting.

Table Ia shows the statistical evaluation of one way ANOVA test between different groups. ANOVA results show that the treatment between the columns and the residual within the columns were statistically significant at1% level.

In table Ib, NEWMAN KEULS multiple comparison test depicts the different groups were statistically significant at 1% level such as

Group 1A vs Group 1D

Group 1A vsGroup1C

Group 1AvsGroup1B

Group 1B vs Group1D

Group 1B vs Group1C

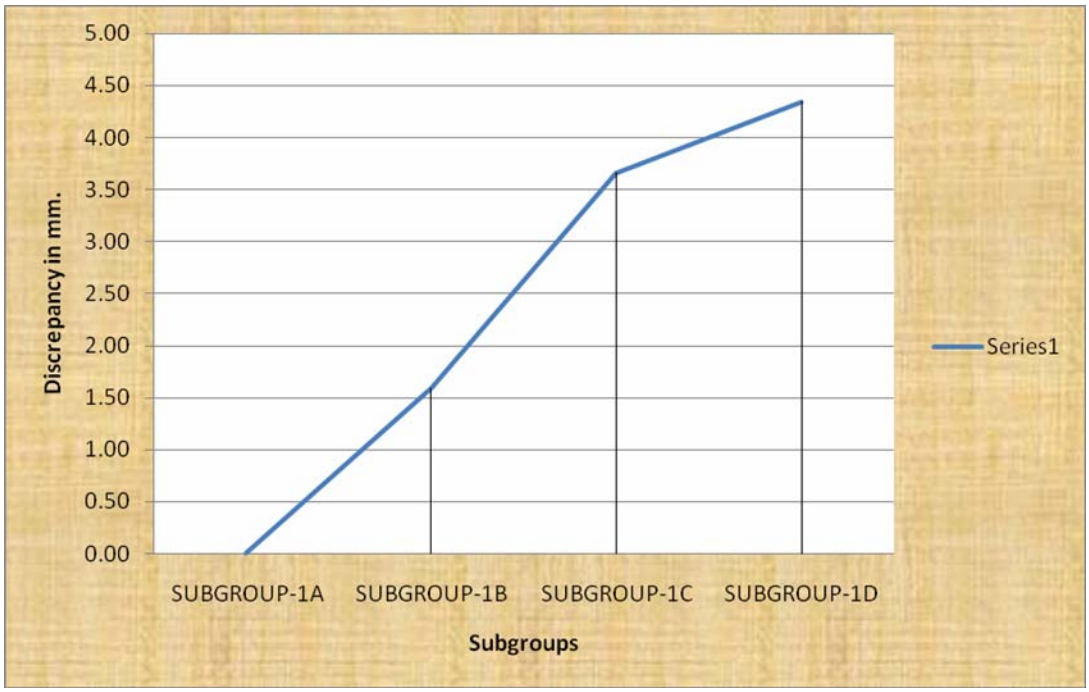
Group 1C vs Group1D

Table II : Measurement taken with different recording techniques with the help of modified Ash's free plane articulator (in mm.)

SUBGROUPS	2AX	2AY	2BX	2BY	2CX	2CY	2DX	2DY
PATIENT 1	0	0	-0.1	0	-1.8	0	-2	2
PATIENT 2	0	0	-0.2	0	-1.7	0.5	-2.5	2.1
PATIENT 3	0	0	-0.2	0.2	-1.9	0.6	-2.3	2.3
PATIENT 4	0	0	0	0	-1.6	0.8	-3.4	3.3
PATIENT 5	0	0	0	0	-1.8	0.1	-2.7	2.1
PATIENT 6	0	0	0	0.3	-1.7	0	-2.3	2
PATIENT 7	0	0	-0.1	0.2	-1.3	0.5	-2.2	2.2
PATIENT 8	0	0	-0.2	0.2	-1.6	0.6	-3.3	2.4
PATIENT 9	0	0	-0.2	0.1	-1.8	0.5	-3.2	2.3
PATIENT 10	0	0	-0.2	0	-1.3	0.5	-3.3	3.1

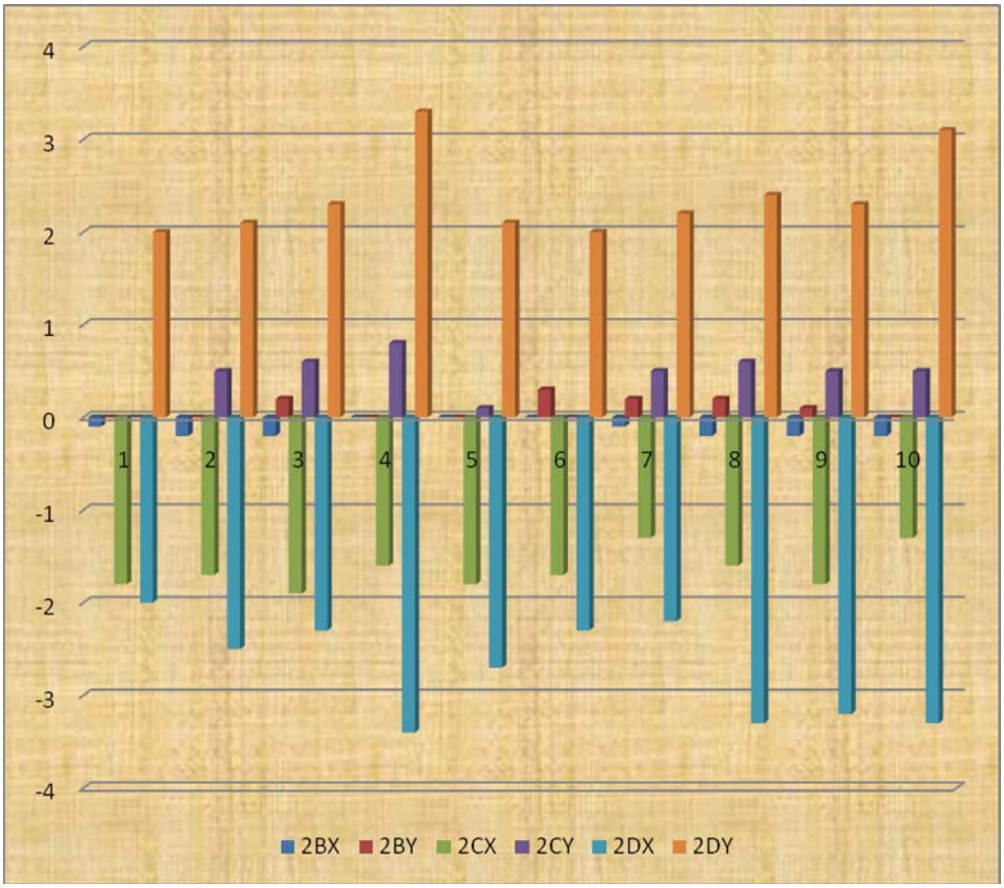
Table II shows the measurements taken with the help of modified Ash's free plane articulator. In this table 'X' and 'Y' denotes the discrepancy in the anterolateral and lateral directions. –ve sign is taken for only graphical representation which otherwise has no significance.

Graphical representation of the discrepancy between different groups evaluated with split cast mounting



Graph 1

Graphical representation of measurement of discrepancies evaluated with modified Ash's free plane articulator.



Graph 2

The graph 2 shows the discrepancy evaluated with Modified Ash free plane articulator. Negative values shows the discrepancy in anteroposterior direction and positive values shows the discrepancy in lateral direction. 2BX denotes the anteroposterior discrepancy measured with extraoral recordings. 2BY denotes the lateral discrepancy measured with extraoral recordings. 2CX denotes the anteroposterior discrepancy measured with nick and notch method. 2CY denotes the lateral discrepancy measured with nick and notch technique. 2DX denotes the anteroposterior discrepancy measured with mush bite technique. 2DY denotes the lateral discrepancy measured with mush bite technique.

DISCUSSION

DISCUSSION

The success of complete denture is determined by correct recording of maxillomandibular relationship. Centric relation is the repeatable position. Patient will be comfortable to perform all the functional and parafunctional movements in this position. Centric relation records can be established by various methods. This study was conducted to evaluate the consistency of various methods of recording centric relation.

Centric relation is the most constant relation of the mandible to the maxilla at the established vertical dimension. It is a bone to bone relationship. It is repeatable, recordable and is a point of reference for establishing centric occlusion. Centric relation is the horizontal reference point of the mandible that can be routinely assumed by the edentulous patients under the direction of the dentist. Many dentures fail because the occlusion is not planned or developed to include this position.

The various methods used for recording centric relation[3] may be classified as static or functional, and each of these may be having extraoral or intraoral techniques.

As told earlier the static methods are those that involve first placing the mandible in centric relation with the maxillae and then making a record of the relationship of the two occlusion rims to each

other. This method has the advantage of causing minimum displacement of record bases in relation to the supporting bone. Intraoral records in the static class are made with wax or plaster, with a central bearing point and with intraoral or extraoral tracing devices to indicate the relative position of the two jaws.

The functional methods are those that involve functional activity or movement of the mandible at the time of record is made. These methods have the disadvantage of causing lateral and anteroposterior displacement of record bases in relation to the supporting bone while the record is being made. The records in the functional class include the various chew-in techniques suggested by Needles, House, and Essig and Paterson. They also include methods of swallowing for positioning and recording the relative position of the jaws.

In this study the methods used to record centric jaw relation are

(1) Intraoral tracing technique,

(2) Extraoral Gothic arch tracing technique,

(3) Nick and Notch technique, and

(4) Mush bite technique.

First two techniques are most frequently used in measuring centric jaw relation. According to Michman and Langer[12] the intraoral tracing technique gave better results than the commonly used method of an interocclusal record, made with the use of wax rims alone. Krishan K.

Kapur and A. Albert Yurkstas[10] also told that intraoral tracing procedure and extraoral tracing procedure were more consistent as compared to wax registration method. Tench[45] also quoted a statement and agreed with the Gysi[45]arrow point technique is the only means that should be used in any practice to establish the most important single measurement taken in construction of full dentures, the centric occlusion relation of mandible to maxilla.

The intraoral tracing procedure has also been criticized by many prosthodontists. Their main objections were based on the general disadvantages of a central bearing point device. Trapozzano[10] stated "the use of the central bearing point is based on the fallacious assumption that the central bearing point will produce equalization of pressure. Trapozzano[10] maintained that the wax recording method was the most accurate method because of the greater ability to equalize or centralize pressure with this technique.

In this study the four techniques are taken for evaluation, two are graphic tracing technique and two are wax recording methods, and intraoral tracing technique is taken as control group.

There is much in prosthodontic literature that maintains that a face-bow transfer is essential for avoiding errors in the occlusion of finished denture. Without a face bow transfer it will be impossible to orient the maxillary cast to the hinge axis.

Semiadjustable Dentatus articulator is used in the study for evaluation of the consistency of different records by using split cast mounting. A semiadjustable articulator was selected because several parameters can be adjusted in this articulator.

The methods of evaluation used in this study are

(1) Split cast mounting[6] and

(2) Modified Ash's free plane articulator.

The modified articulator concept used in the present study is modification of the instrument used by Krishan K. Kapur[10] in 1957.

In this present study four different techniques for recording centric relation were used; namely,

(1) Intraoral graphic tracing (subgroup 1A &2A),

(2) Extraoral Gothic arch tracing (subgroup 1B &2B),

(3) Nick and Notch method (subgroup 1C &2C) and

(4) Mush bite technique (subgroup1D & 2D).

Intraoral recordings are taken as control group.

According to the results, among the other three groups, extraoral groups give the closest reading to the control group. And the mush bite records show the maximum deviation. And the nick and notch records fall in between the two. Group 1B and 2B show least deviation in the range of 1

mm. Subgroups 1C and 2C show a deviation upto 3mm, and subgroups 1D and 2D show maximum deviation upto 4mm in split cast mounting evaluation.

After analysing the data obtained from the study, it was found that when the different subgroups were compared with control subgroup, mush bite technique for registration of centric relation showed maximum discrepancy. The difference was statistically significant with $p<0.05$, among all subgroups evaluated with split cast mounting.

The readings of extraoral Gothic arch technique found to the closest to the control subgroup. Graph 1 compares discrepancy among different subgroups evaluated with split cast mounting. Subgroup-1A (control) is closest to subgroup-1B (extraoral Gothic arch tracing). And subgroup-1D shows an average discrepancy of more than 4mm.

Table II shows the measurements taken with different recording techniques with the help of modified Ash's free plane articulator. In this table it can be observed that Mush bite record subgroup gave a discrepancy upto a maximum of 3.3mm. And extraoral Gothic arch tracing records showed least discrepancy. These findings are in accordance with the previous literature. Graph 2 showed the representation of discrepancies of four subgroups which are evaluated with modified Ash's free plane articulator. In this graphical representation it can be visualized that the maximum discrepancy is

shown by blue and orange colour columns. The positive values describe the discrepancy in lateral direction and the negative values in the anteroposterior direction. Control subgroup columns are not visible because the reading is kept as zero. As described in table II, extraoral Gothic arch tracing subgroups 2BX and 2BY showed least height columns and can be interpreted as least deviated from control.

SUMMARY & CONCLUSION

SUMMARY AND CONCLUSION

This study was performed to evaluate the consistency of four different centric relation records and comparing their horizontal deviation with the control subgroup (recordings by intraoral tracing technique) and with each other taken from ten different edentulous individuals.

The problems of occlusion extend into nearly all branches of dentistry. While the principles involved are the same, their application should be different according to the situation.

Centric relation can be located by many techniques but there is some variability in the results obtained by any of them. Therefore, each dentist should have a means of comparing his registrations so that an intelligent selection can be made.

The dentist should not fall into the error of trying to make the same application in all situations. An accurate centric jaw relationship record is important when constructing dentures. It is a three-dimensional record and, to be accurate for a given individual, the relationship, anteroposteriorly and laterally, should be recorded at the occlusal vertical dimension deemed correct for the individual.

This study demonstrates a significant statistical difference between the recordings taken with intraoral tracing technique and among

other subgroups evaluated by two techniques. The recordings made with the extraoral Gothic arch tracing technique values were closer to the control as compared with two other subgroups in both the evaluations.

Furthermore this study does not show the superiority of any of method for recording centric jaw relation on one another. This study only shows the deviation of the recordings made with four different techniques among different subgroups.

Accurate records for centric jaw relation can be made with any of these techniques, but the chances of errors are more in tactile methods as compared to graphic methods.

ANNEXURE

ANNEXURE

Table III: The split cast mounting measurements for various groups based on different methods.

PATIENT	Measurement Replication	GROUP-1A (mm)	GROUP-1B (mm)	GROUP-1C (mm)	GROUP-1D (mm)
1	A	0	Lt Lat=1.2 Rt Lat=1.4 Ant=2.3 Mean=1.6333	Lt Lat=3.4 Rt Lat=3.5 Ant=4.2 Mean=3.7	Lt Lat=3.9 Rt Lat=3.8 Ant=4.9 Mean=4.2
	B	0	Lt Lat=1.3 Rt Lat=1.3 Ant=2.3 Mean=1.6333	Lt Lat=3.3 Rt Lat=3.4 Ant=4.1 Mean=3.6	Lt Lat=3.8 Rt Lat=3.9 Ant=4.9 Mean=4.2
	C	0	Lt Lat=1.4 Rt Lat=1.2 Ant=2.2 Mean=1.6	Lt Lat=3.3 Rt Lat=3.5 Ant=4.2 Mean=3.6666	Lt Lat=3.4 Rt Lat=3.7 Ant=4.8 Mean=3.96666
	D	0	Lt Lat=1.2 Rt Lat=1.3 Ant=2.4 Mean=1.63333	Lt Lat=3.2 Rt Lat=3.3 Ant=4.2 Mean=3.56666	Lt Lat=3.9 Rt Lat=3.7 Ant=4.8 Mean=4.133333
	E	0	Lt Lat=1.3 Rt Lat=1.3 Ant=2.3 Mean=1.63333	Lt Lat=3.5 Rt Lat=3.5 Ant=4.3 Mean=3.76666	Lt Lat=3.8 Rt Lat=3.7 Ant=4.7 Mean=4.06

S.D		0	0.014898928	0.079580572	0.099713104
MEAN		0	1.6266	3.6599	4.1119
2	A	0	Lt Lat=1.5 Rt Lat=1.4 Ant=2.5 Mean=1.8	Lt Lat=3.4 Rt Lat=3.7 Ant=4.4 Mean=3.8333	Lt Lat=3.8 Rt Lat=4.1 Ant=5.1 Mean=4.3333
	B	0	Lt Lat=1.4 Rt Lat=1.4 Ant=2.5 Mean=1.7666	Lt Lat=3.5 Rt Lat=3.6 Ant=4.4 Mean=3.8333	Lt Lat=3.9 Rt Lat=4.2 Ant=5.0 Mean=4.3666
	C	0	Lt Lat=1.3 Rt Lat=1.5 Ant=2.4 Mean=1.7333	Lt Lat=3.5 Rt Lat=3.7 Ant=4.5 Mean=3.9	Lt Lat=3.7 Rt Lat=4.1 Ant=5.2 Mean=4.33333
	D	0	Lt Lat=1.5 Rt Lat=1.5 Ant=2.4 Mean=1.8	Lt Lat=3.4 Rt Lat=3.7 Ant=4.4 Mean=3.8333	Lt Lat=3.7 Rt Lat=4.1 Ant=5.1 Mean=4.3
	E	0	Lt Lat=1.4 Rt Lat=1.3 Ant=2.4 Mean=1.7	Lt Lat=3.5 Rt Lat=3.7 Ant=4.5 Mean=3.9	Lt Lat=3.8 Rt Lat=4.2 Ant=5.1 Mean=4.36666
S.D		0	0.043463916	0.036533095	0.027873339
MEAN		0	1.7599	3.85998	4.3398
3	A	0	Lt Lat=1.1 Rt Lat=1.3	Lt Lat=3.5 Rt Lat=3.4	Lt Lat=3.9 Rt Lat=3.8

			Ant=2.2 Mean=1.5333	Ant=4.4 Mean=3.7666	Ant=5.1 Mean=4.2666
	B	0	Lt Lat=1.2 Rt Lat=1.2 Ant=2.2 Mean=1.5333	Lt Lat=3.4 Rt Lat=3.5 Ant=4.4 Mean=3.7666	Lt Lat=3.8 Rt Lat=3.8 Ant=5.0 Mean=4.2
	C	0	Lt Lat=1.2 Rt Lat=1.3 Ant=2.3 Mean=1.6	Lt Lat=3.4 Rt Lat=3.5 Ant=4.5 Mean=3.8	Lt Lat=3.8 Rt Lat=3.9 Ant=5.1 Mean=4.2666
	D	0	Lt Lat=1.2 Rt Lat=1.1 Ant=2.3 Mean=1.53333	Lt Lat=3.5 Rt Lat=3.5 Ant=4.5 Mean=3.8333	Lt Lat=4.0 Rt Lat=3.7 Ant=5.2 Mean=4.3
	E	0	Lt Lat=1.4 Rt Lat=1.3 Ant=2.2 Mean=1.6333	Lt Lat=3.6 Rt Lat=3.4 Ant=4.5 Mean=3.8333	Lt Lat=4.0 Rt Lat=3.8 Ant=5.1 Mean=4.3
S.D.		0	0.047141045	0.033350007	0.040824845
MEAN		0	1.5666	3.7999	4.266
4	A	0	Lt Lat=1.4 Rt Lat=1.5 Ant=2.5 Mean=1.8	Lt Lat=3.5 Rt Lat=3.6 Ant=4.6 Mean=3.9	Lt Lat=4.1 Rt Lat=4.0 Ant=5.1 Mean=4.4
	B	0	Lt Lat=1.4 Rt Lat=1.6 Ant=2.5	Lt Lat=3.5 Rt Lat=3.5 Ant=4.5	Lt Lat=4.1 Rt Lat=3.9 Ant=5.1

			Mean=1.8333	Mean=3.8333	Mean=4.3666
	C	0	Lt Lat=1.5 Rt Lat=1.5 Ant=2.6 Mean=1.8666	Lt Lat=3.5 Rt Lat=3.4 Ant=4.5 Mean=3.8	Lt Lat=4.0 Rt Lat=4.0 Ant=5.1 Mean=4.3666
	D	0	Lt Lat=1.4 Rt Lat=1.5 Ant=2.4 Mean=1.7666	Lt Lat=3.5 Rt Lat=3.5 Ant=4.4 Mean=3.8	Lt Lat=4.0 Rt Lat=3.9 Ant=5.0 Mean=4.3
	E	0	Lt Lat=1.5 Rt Lat=1.6 Ant=2.5 Mean=1.866	Lt Lat=3.5 Rt Lat=3.5 Ant=4.6 Mean=3.8666	Lt Lat=4.1 Rt Lat=4.0 Ant=5.0 Mean=4.3666
S.D.		0	0.043315009	0.043452411	0.036505726
MEAN		0	1.826	3.83998	4.3596
5	A	0	Lt Lat=1.4 Rt Lat=1.5 Ant=2.2 Mean=1.7	Lt Lat=3.4 Rt Lat=3.4 Ant=4.2 Mean=3.666	Lt Lat=4.1 Rt Lat=4.2 Ant=5.2 Mean=4.5
	B	0	Lt Lat=1.5 Rt Lat=1.4 Ant=2.2 Mean=1.7	Lt Lat=3.4 Rt Lat=3.3 Ant=4.2 Mean=3.6333	Lt Lat=4.2 Rt Lat=4.1 Ant=5.2 Mean=4.5
	C	0	Lt Lat=1.4 Rt Lat=1.4 Ant=2.1 Mean=1.6333	Lt Lat=3.3 Rt Lat=3.4 Ant=4.1 Mean=3.6	Lt Lat=4.2 Rt Lat=4.1 Ant=5.2 Mean=4.5

	D	0	Lt Lat=1.3 Rt Lat=1.4 Ant=2.1 Mean=1.6	Lt Lat=3.4 Rt Lat=3.3 Ant=4.1 Mean=3.6	Lt Lat=4.1 Rt Lat=4.1 Ant=5.1 Mean=4.433
	E	0	Lt Lat=1.4 Rt Lat=1.5 Ant=2.2 Mean=1.7	Lt Lat=3.5 Rt Lat=3.4 Ant=4.2 Mean=3.7	Lt Lat=4.1 Rt Lat=4.1 Ant=5.2 Mean=4.4666
S.D		0	0.047146347	0.04336125	0.029952162
MEAN		0	1.6666	3.6398	4.4799
6	A	0	Lt Lat=1.4 Rt Lat=1.3 Ant=2.3 Mean=1.666	Lt Lat=3.4 Rt Lat=3.5 Ant=4.3 Mean=3.7333	Lt Lat=4.1 Rt Lat=4.2 Ant=5.2 Mean=4.5
	B	0	Lt Lat=1.4 Rt Lat=1.4 Ant=2.3 Mean=1.7	Lt Lat=3.4 Rt Lat=3.4 Ant=4.3 Mean=3.7	Lt Lat=4.2 Rt Lat=4.2 Ant=5.2 Mean=4.5333
	C	0	Lt Lat=1.3 Rt Lat=1.3 Ant=2.2 Mean=1.6	Lt Lat=3.3 Rt Lat=3.5 Ant=4.2 Mean=3.6666	Lt Lat=4.1 Rt Lat=4.3 Ant=5.3 Mean=4.5666
	D	0	Lt Lat=1.4 Rt Lat=1.2 Ant=2.3 Mean=1.633	Lt Lat=3.3 Rt Lat=3.5 Ant=4.2 Mean=3.666	Lt Lat=4.3 Rt Lat=4.2 Ant=5.3 Mean=4.6
	E	0	Lt Lat=1.2	Lt Lat=3.4	Lt Lat=4.3

			Rt Lat=1.3 Ant=2.2 Mean=1.5666	Rt Lat=3.6 Ant=4.3 Mean=3.766	Rt Lat=4.3 Ant=5.2 Mean=4.6
S.D.		0	0.052621022	0.043396221	0.043463916
MEAN		0	1.633	3.705	4.5599
7	A	0	Lt Lat=1.3 Rt Lat=1.6 Ant=2.4 Mean=1.766	Lt Lat=3.4 Rt Lat=3.3 Ant=4.2 Mean=3.6333	Lt Lat=3.8 Rt Lat=3.9 Ant=4.9 Mean=4.2
	B	0	Lt Lat=1.3 Rt Lat=1.5 Ant=2.4 Mean=1.7333	Lt Lat=3.3 Rt Lat=3.2 Ant=4.2 Mean=3.5666	Lt Lat=3.7 Rt Lat=3.8 Ant=4.9 Mean=4.1333
	C	0	Lt Lat=1.4 Rt Lat=1.6 Ant=2.3 Mean=1.76666	Lt Lat=3.3 Rt Lat=3.4 Ant=4.2 Mean=3.6333	Lt Lat=3.7 Rt Lat=3.8 Ant=4.8 Mean=4.1
	D	0	Lt Lat=1.3 Rt Lat=1.5 Ant=2.4 Mean=1.73333	Lt Lat=3.3 Rt Lat=3.4 Ant=4.1 Mean=3.6	Lt Lat=3.6 Rt Lat=3.8 Ant=4.7 Mean=4.0333
	E	0	Lt Lat=1.4 Rt Lat=1.5 Ant=2.4 Mean=1.7666	Lt Lat=3.4 Rt Lat=3.3 Ant=4.1 Mean=3.6	Lt Lat=3.9 Rt Lat=3.9 Ant=4.9 Mean=4.23333
S.D		0	0.018134195	0.027896649	0.079593134
MEAN		0	1.7531	3.6065	4.1399

8	A	0	Lt Lat=1.1 Rt Lat=1.2 Ant=2.1 Mean=1.466	Lt Lat=3.4 Rt Lat=3.3 Ant=4.2 Mean=3.6333	Lt Lat=4.0 Rt Lat=4.2 Ant=5.2 Mean=4.4666
	B	0	Lt Lat=1.1 Rt Lat=1.1 Ant=2.1 Mean=1.4333	Lt Lat=3.3 Rt Lat=3.3 Ant=4.1 Mean=3.56666	Lt Lat=4.0 Rt Lat=4.1 Ant=5.1 Mean=4.4
	C	0	Lt Lat=1.1 Rt Lat=1.2 Ant=2.0 Mean=1.4333	Lt Lat=3.5 Rt Lat=3.3 Ant=4.1 Mean=3.6333	Lt Lat=4.1 Rt Lat=4.2 Ant=5.2 Mean=4.5
	D	0	Lt Lat=1.1 Rt Lat=1.1 Ant=2.0 Mean=1.4	Lt Lat=3.4 Rt Lat=3.2 Ant=4.1 Mean=3.5666	Lt Lat=4.1 Rt Lat=4.2 Ant=5.2 Mean=4.5
	E	0	Lt Lat=1.2 Rt Lat=1.2 Ant=2.1 Mean=1.5	Lt Lat=3.3 Rt Lat=3.2 Ant=4.2 Mean=3.5666	Lt Lat=4.1 Rt Lat=4.2 Ant=5.1 Mean=4.4666
S.D		0	0.037925018	0.036522148	0.040824845
MEAN		0	1.4465	3.5932	4.4666
9	A	0	Lt Lat=1.3 Rt Lat=1.4 Ant=2.4 Mean=1.7	Lt Lat=3.5 Rt Lat=3.4 Ant=4.3 Mean=3.73333	Lt Lat=3.9 Rt Lat=4.1 Ant=5.0 Mean=4.333

	B	0	Lt Lat=1.3 Rt Lat=1.3 Ant=2.4 Mean=1.6666	Lt Lat=3.4 Rt Lat=3.3 Ant=4.3 Mean=3.66666	Lt Lat=3.8 Rt Lat=4.1 Ant=5.0 Mean=4.3
	C	0	Lt Lat=1.2 Rt Lat=1.3 Ant=2.3 Mean=1.6	Lt Lat=3.6 Rt Lat=3.3 Ant=4.2 Mean=3.7	Lt Lat=3.8 Rt Lat=4.0 Ant=5.0 Mean=4.26666
	D	0	Lt Lat=1.3 Rt Lat=1.4 Ant=2.3 Mean=1.6666	Lt Lat=3.4 Rt Lat=3.4 Ant=4.3 Mean=3.7	Lt Lat=4.0 Rt Lat=4.1 Ant=5.1 Mean=4.4
	E	0	Lt Lat=1.4 Rt Lat=1.4 Ant=2.4 Mean=1.73333	Lt Lat=3.4 Rt Lat=3.5 Ant=4.2 Mean=3.7	Lt Lat=3.9 Rt Lat=4.0 Ant=5.0 Mean=4.3
S.D.		0	0.04944482	0.023571405	0.050532496
MEAN		0	1.673	3.7	4.3199
10	A	0	Lt Lat=1.3 Rt Lat=1.4 Ant=2.4 Mean=1.7	Lt Lat=3.4 Rt Lat=3.5 Ant=4.3 Mean=3.7333	Lt Lat=3.9 Rt Lat=4.0 Ant=4.9 Mean=4.2666
	B	0	Lt Lat=1.3 Rt Lat=1.3 Ant=2.4 Mean=1.6666	Lt Lat=3.4 Rt Lat=3.4 Ant=4.3 Mean=3.7	Lt Lat=3.9 Rt Lat=4.1 Ant=4.9 Mean=4.3
	C	0	Lt Lat=1.3	Lt Lat=3.3	Lt Lat=3.9

			Rt Lat=1.3 Ant=2.3 Mean=1.6333	Rt Lat=3.5 Ant=4.2 Mean=3.6666	Rt Lat=3.9 Ant=4.7 Mean=4.16666
	D	0	Lt Lat=1.2 Rt Lat=1.3 Ant=2.3 Mean=1.6	Lt Lat=3.3 Rt Lat=3.4 Ant=4.3 Mean=3.6666	Lt Lat=3.9 Rt Lat=4.1 Ant=4.8 Mean=4.2666
	E	0	Lt Lat=1.3 Rt Lat=1.3 Ant=2.4 Mean=1.6666	Lt Lat=3.3 Rt Lat=3.4 Ant=4.3 Mean=3.6666	Lt Lat=3.8 Rt Lat=4.0 Ant=4.9 Mean=4.2333
S.D		0	0.037998553	0.029834745	0.05054416
MEAN		0	1.6531	3.6865	4.2466

Table – IV: Mean and standard deviation of different measurement locations among various groups by split cast mounting.

	GROUP-1A		GROUP-1B		GROUP-1C		GROUP-1D	
	MEAN (mm)	S.D (mm)	MEAN (mm)	S.D (mm)	MEAN (mm)	S.D (mm)	MEAN (mm)	S.D (mm)
PATIENT 1	0	0	1.63	0.01489	3.66	0.079	4.11	0.099
PATIENT 2	0	0	1.76	0.04346	3.86	0.0365	4.33	0.02787
PATIENT 3	0	0	1.56	0.047141	3.8	0.17	4.26	0.0408
PATIENT 4	0	0	1.82	0.043315	3.83	0.043	4.35	0.0365
PATIENT 5	0	0	1.66	0.0471	3.63	0.043	4.47	0.299
PATIENT 6	0	0	1.63	0.0526	3.7	0.0433	4.55	0.434
PATIENT 7	0	0	1.75	0.0181	3.6	0.02789	4.13	0.0795
PATIENT 8	0	0	1.44	0.38	3.6	0.365	4.46	0.0408
PATIENT 9	0	0	1.67	0.04944	3.7	0.2357	4.32	0.0505
PATIENT 10	0	0	1.65	0.038	3.68	0.0298	4.24	0.05

INFORMED CONSENT FORM

Title of the work: **A CRITICAL EVALUATION OF DIFFERENT METHODS OF RECORDING CENTRIC JAW RELATION OF COMPLETELY EDENTULOUS INDIVIDUALS** - An in-vivo study

Name : _____ **O.P.No.:** _____

Address : _____ **Case No.:**_____

_____ **Age** : _____

_____ **Sex** : _____

I, _____ Age _____ Yrs, exercising my free power of choice, hereby give my consent to be included as a participant in the clinical study. I agree to the following:

I have been informed to my satisfaction about the purpose of the study, nature of the treatment, follow-up visits and study procedures including investigations, to monitor and to safeguard by body function.

I understand that the clinical procedure will require measurement of jaw relations.

I have informed that I have to wear a Face-bow for positioning of the upper cast in articulator.

I agree to co-operative fully and inform the dentist immediately if I suffer any unusual symptoms.

I have informed the dentist, about all medications and dental treatments that I have taken in the recent past and those I am currently taking. I shall not take any medications without the concern of the dentist.

I understand that dentist may stop my participation from the clinical study for any reasons. I am also aware of my right to opt out of the study at any time during the clinical study duration without giving any reason.

I hereby give permission to use my records for research purpose and I am told that study institution and dentist will keep my identity confidential.

_____ _____

Name of the Patient **Signature & Date**

Name of Impartial Witness	**Signature & Date**
Name of the Investigator	**Signature & Date**

ஆராய்ச்சி ஒப்புதல் படிவம்

ஆராய்ச்சி தலைப்பு:-
"ஜெலட்டின் சைமோகிராபி ஆய்வைக் கொண்டு, ஈறுநோயின் திசு வெள்ளை அணுக்கள் பிரிவைச் சேர்ந்த மெட்ரிக்கஸ், மெடலோ பிரோட்டினேஸின் அளவும் அதன் செயல்பாடும் குறித்து ஓர் ஆய்வு".

பெயர் : _____ புற நோயாளியின் எண் : _____
முகவரி : _____ ஆராய்ச்சி சேர்க்கை எண் : _____
_____ வயது : _____
_____ பாலினம் ☐ ஆண் ☐ பெண்

நான் …….. வயது ……. என்னுடைய சுயநினைவுடன் மற்றும் முழு சுதந்திரத்துடன், இந்த மருத்துவ ஆராய்ச்சி என்னை சேர்த்துக் கொள்ள சம்மதிக்கிறேன்.

எனக்கு விளக்கப்பட்ட விஷயங்களுக்கு நான் எனது சம்மதத்தை தருகிறேன்.

- இந்த ஆராய்ச்சியின் நோக்கம், மருத்துவ முறைகள் பரிசோதனை முறைகள் எனக்கு திருப்தியுறும் வகையில் விளக்கப்பட்டன.
- பரிசோதனை செய்வதற்காக என் உடம்பிலிருந்து வேண்டாத பல் புறத்திசு எடுக்கப்பட வேண்டியுள்ளதாக அறிகிறேன்.
- நான் எடுத்து வருகின்ற மற்றும் முன் உட்கொண்ட மருந்துகள் பற்றிய விவரங்களை ஆராய்ச்சியாளரிடம் அறிவிக்க சம்மதம்.
- என் உடல்நலம் பாதிக்கப்பட்டாலோ அல்லது எதிர்பாராத, வழக்கத்திற்கு மாறான நோய்குறி தென்பட்டாலோ உடனே அதை மருத்துவரிடம் தெரிவிப்பேன் என உறுதியளிக்கிறேன்.
- எனக்கும் மற்றும் மருந்து ஆராய்ச்சியாளருக்கும் இந்த ஆராய்ச்சியிலிருந்து எந்த ஒரு நிலையிலும் விலகுவதற்கோ அல்லது விலக்குவதற்கோ முழு உரிமை இருப்பதாக அறிகிறேன்.
- என்னுடைய மருத்துவக் குறிப்பேடுகளை இந்த ஆராய்ச்சியில் பயன்படுத்திக் கொள்ள சம்மதிக்கிறேன், ஆராய்ச்சி மையமும், ஆராய்ச்சியாளரும் என்னுடைய பெயர் மற்றும் சில விவரங்களை இரகசியமாக வைப்பதாக அறிகிறேன்.

நோயாளியின் பெயர்	கையெழுத்து	தேதி
ஆராய்ச்சியாளரின் பெயர்	கையெழுத்து	தேதி

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